

APPARATUS AND METHOD FOR ENHANCING DYNAMIC RANGE OF CHARGE COUPLED DEVICE-BASED SPECTROGRAPH

ABSTRACT OF THE DISCLOSURE

The present invention is directed to an apparatus, method and software product
5 for enhancing the dynamic range of a CCD sensor without substantially increasing the
noise. Initially, the area of a $N \times M$ pixel CCD sensor array is subdivided into two
regions, a large region having $(M - a)$ pixels in each column for outputting large-
amplitude signals with low noise and a smaller region having a pixels in each column for
outputting small-amplitude signals with improved dynamic range. At integration time,
10 the CCD is read out one region's rows at a time into the horizontal shift registers by
shifting the pixel charges in either a or $M - a$ vertical shifts. The charges in the
horizontal shift registers are then shifted out of the horizontal shift registers in N
horizontal shifts. Next, the remaining pixels in the region of the CCD are read out into
the horizontal shift registers by shifting the pixel charges in the other of a or $M - a$
15 vertical shifts. Those charges are then shifted out of the horizontal shift registers in N
horizontal shifts. In a spectrographic application, the data from the two regions is read
out in the form of a large-amplitude channel from the larger region's rows and a small-
amplitude channel from the smaller region's rows.